

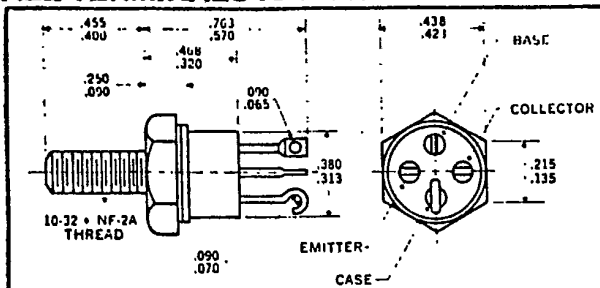
# 2N5659

## 10 AMP

### HIGH SPEED NPN TRANSISTOR

## 120 VOLTS

14830 Valley View Avenue  
La Mirada, California 90638  
(213) 921-9660  
TWX 910-583-4807  
FAX 213-921-2396

**CASE STYLE Z****JEDEC TO-111****ALL TERMINALS ISOLATED FROM CASE****FEATURES**

- RADIATION TOLERANT
- FAST SWITCHING, 150 NSEC MAX  $t_{on}$
- HIGH FREQUENCY, TYPICAL  $f_T$  100 MHZ
- BVCEO 80 VOLTS MIN
- HIGH LINEAR GAIN, LOW SATURATION VOLTAGE
- 200°C OPERATING, GOLD EUTECTIC DIE ATTACH
- DESIGNED FOR COMPLEMENTARY USE WITH 2N6188 AND 2N6189

**MAXIMUM RATINGS**

Rating	Symbol	Value	Unit
Collector - Emitter Voltage	$V_{CEO}$	80	Volts
Collector - Base Voltage	$V_{CBO}$	120	Volts
Emitter - Base Voltage	$V_{EBO}$	7	Volts
Collector Current	$I_C$	10	Amps
Base Current	$I_B$	2	Amps
Total Device Dissipation @ $T_C = 100^\circ\text{C}$	$P_D$	30	Watts
Derate above 100 °C		300	mW/°C
Operating and Storage Temperature	$T_j, T_{stg}$	-65 to +200	°C

**THERMAL CHARACTERISTICS**

Characteristics	Symbol	Value	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	3.33	°C/W

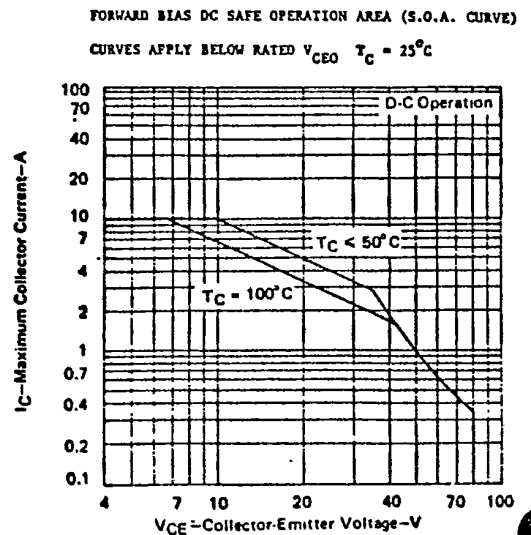
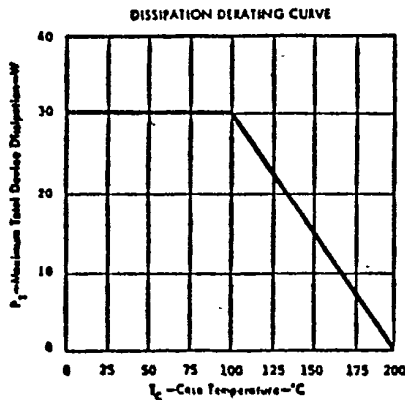
**ELECTRICAL CHARACTERISTICS**

Characteristics	Symbol	Min.	Max.	Unit
Collector - Emitter Breakdown Voltage* ( $I_C = 100$ mA dc)	$BV_{CEO}$	80		Vdc
( $I_C = 100$ mA dc, $R_{BE} = 10$ ohms)	$BV_{CER}$	120		Vdc
Collector - Base Breakdown Voltage ( $I_C = 200$ uA dc)	$BV_{CBO}$	120		Vdc
Emitter - Base Breakdown Voltage ( $I_E = 200$ uA dc)	$BV_{EBO}$	7		Vdc

Characteristics	Symbol	Min.	Max.	Unit
Collector Cutoff Current ( $V_{CE} = 120$ Vdc)	$I_{CES}$		200	nAdc
Collector Cutoff Current ( $V_{CE} = 80$ Vdc, $T_C = 150^\circ\text{C}$ )	$I_{CES}$		100	uAdc
Emitter Cutoff Current ( $V_{EB} = 7$ Vdc)	$I_{EBO}$		10	uAdc
DC Current Gain* ( $I_C = 500$ mAdc, $V_{CE} = 2$ Vdc) ( $I_C = 5$ Adc, $V_{CE} = 5$ Vdc) ( $I_C = 10$ Adc, $V_{CE} = 5$ Vdc)	$h_{FE}$	40 50 30	250 150	
Collector - Emitter Saturation Voltage* ( $I_C = 5$ Adc, $I_B = 500$ mAdc) ( $I_C = 10$ Adc, $I_B = 1$ Adc)	$V_{CE(SAT)}$		0.5 1.0	Vdc
Base - Emitter Saturation Voltage* ( $I_C = 5$ Adc, $I_B = 500$ mAdc) ( $I_C = 10$ Adc, $I_B = 1$ Adc)	$V_{BE(SAT)}$		1.3 1.8	Vdc
Current - Gain - Bandwidth Product ( $I_C = 500$ mAdc, $V_{CE} = 5$ Vdc, $f = 10$ MHz)	$f_T$	30		M Hz
Output Capacitance ( $V_{CB} = 10$ Vdc, $I_E = 0$ , $f = 1$ MHz)	$C_{ob}$		150	pf
Delay Time Rise Time Storage Time Fall Time	$t_d$ $t_r$ $t_s$ $t_f$		150	ns
( $V_{CC} = 25$ Vdc, $I_C = 5$ Adc, $I_{B1} = I_{B2} = 250$ mAdc, Base - Emitter clamp diode = 1N5802 or equivalent)	( $t_{on}$ ) ( $t_{off}$ )		800	ns

\*Pulse Test: Pulse width = 300 us, Duty Cycle = 2%

**TYPICAL OPERATING CURVES**



# 2N5006 AND 2N5008

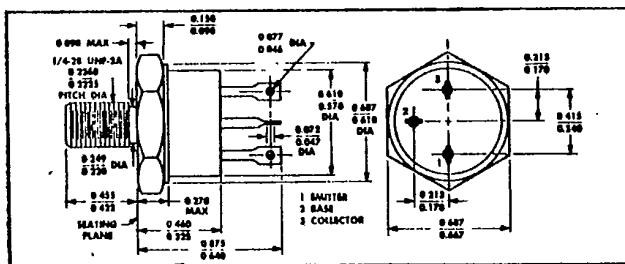
## 10 AMP

### HIGH SPEED NPN TRANSISTOR

## 100 VOLTS



14830 Valley View Avenue  
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**CASE STYLE T****JEDEC TO-61****ALL TERMINALS ISOLATED FROM CASE****FEATURES**

- RADIATION TOLERANT
- FAST SWITCHING, 100 NSEC MAX  $t_d$
- HIGH FREQUENCY, TYPICAL  $f_T$  100 MHZ
- BVCEO 80 VOLTS MIN
- HIGH LINEAR GAIN, LOW SATURATION VOLTAGE
- 200 °C OPERATING, GOLD EUTECTIC DIE ATTACH
- DESIGNED FOR COMPLEMENTARY USE WITH 2N5007 AND 2N5009

**MAXIMUM RATINGS**

Rating	Symbol	Value	Unit
Collector - Emitter Voltage	$V_{CEO}$	80	Volts
Collector - Base Voltage	$V_{CBO}$	100	Volts
Emitter - Base Voltage	$V_{EBO}$	6	Volts
Collector Current	$I_C$	10	Amps
Base Current	$I_B$	3	Amps
Total Device Dissipation @ $T_C = 50^\circ\text{C}$	$P_D$	100	Watts
Derate above 50 °C		667	mW/°C
Operating and Storage Temperature	$T_j, T_{stg}$	-65 to +200	°C

**THERMAL CHARACTERISTICS**

Characteristics	Symbol	Value	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	1.5	°C/W

**ELECTRICAL CHARACTERISTICS**

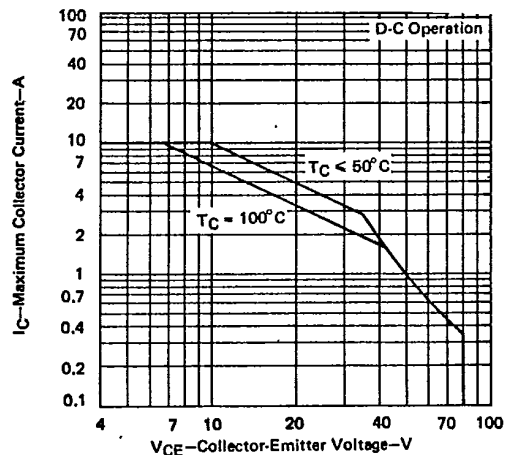
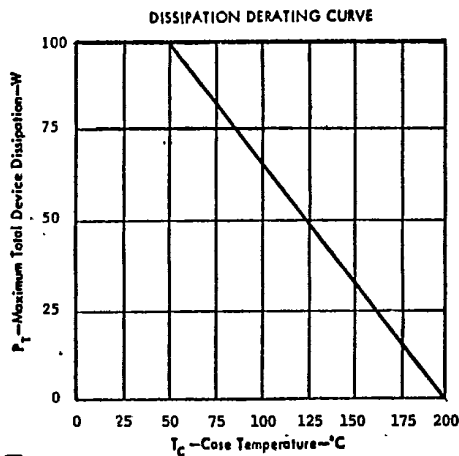
Characteristics	Symbol	Min.	Max.	Unit
Collector - Emitter Breakdown Voltage* ( $I_C = 200$ mA dc)	$BV_{CEO}^*$	80		Vdc
Collector - Base Breakdown Voltage ( $I_C = 200$ $\mu$ A dc)	$BV_{CBO}$	100		Vdc
Emitter - Base Breakdown Voltage ( $I_E = 200$ $\mu$ A dc)	$BV_{EBO}$	6		Vdc

Characteristics		Symbol	Min.	Max.	Unit
Collector Cutoff Current (VCE = 40 Vdc) (VCE = 60 Vdc)		ICEO ICES		50 1.0	uAdc uAdc
Collector Cutoff Current (VCE = 100Vdc) (VCE = 60 Vdc, VBE = 2 Vdc, TC = 150°C)		ICEX ICEX		1.0 500	mAdc uAdc
Emitter Cutoff Current (VEB = 4 Vdc) (VEB = 5.5 Vdc)		IEBO		1.0 1.0	uAdc mAdc
DC Current Gain*					
(IC = 100 mAdc, VCE = 5 Vdc)	2N5006	hFE*	20	90	
(IC = 5 Adc, VCE = 5 Vdc)	2N5008		50		
(IC = 10 Adc, VCE = 5 Vdc)	2N5006		30		
	2N5008		70		
	2N5006		20		
	2N5008	45			
Collector - Emitter Saturation Voltage*					
(IC = 5 Adc, IB = 500 mAdc)		VCE (SAT)*		0.9	Vdc
(IC = 10 Adc, IB = 500 mAdc)			1.5		
Base - Emitter Saturation Voltage*					
(IC = 5 Adc, IB = 500 mAdc)		VBE (SAT)*		1.8	Vdc
(IC = 10 Adc, IB = 1 Adc)			2.2		
Current - Gain - Bandwith Product (IC = 500 mAdc, VCE = 5 Vdc, f = 20 MHz)		2N5006 2N5008	35 40		MHz
Output Capacitance (VCB = 10 Vdc, IE = 0, f = 1 MHz)				275	pf
Base - Emitter Voltage* (VCE = 5 Vdc, IC = 5 Adc)				1.8	Vdc
Delay Time	(VCC = 40 Vdc)	td		100	ns
Rise Time	VEB(off) = 3.0 Vdc,	tr		100	ns
Storage Time	IC = 2 Adc,	ts		2.0	us
Fall Time	IB1 = IB2 = 200 mAdc)	tf		200	ns

\*Pulse Test: Pulse width = 300 us, DutyCycle = 2%

TYPICAL OPERATING CURVES

FORWARD BIAS DC SAFE OPERATION AREA (S.O.A. CURVE)  
CURVES APPLY BELOW RATED VCE0 TC = 25°C



# SFT6200

## 10 AMP

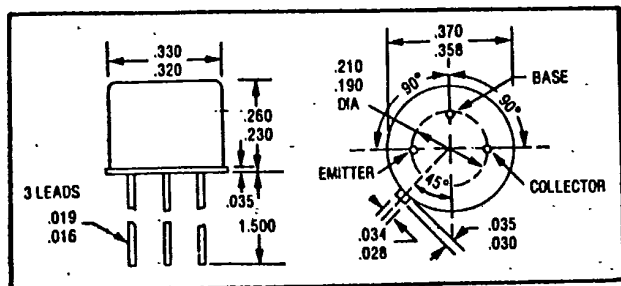
### RADIATION TOLLERANT NPN TRANSISTOR

## 150 VOLTS



14830 Valley View Avenue  
La Mirada, California 90638  
(213) 921-9660  
TWX 910-583-4807  
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#### CASE STYLE W JEDEC TO-5



#### FEATURES

- MIN  $h_{FE}$  OF 10 AT 1A, 10V. AFTER  $1 \times 10^{14}$  FAST NEUTRONS/CM<sup>2</sup>
- HIGH FREQUENCY, 150MHZ TYPICAL
- ULTRA FAST, 150ns TYPICAL  $t_{on}$
- BVCEO 80 VOLTS MIN
- HIGH LINEAR GAIN, VERY LOW SATURATION
- 200°C OPERATING TEMPERATURE
- GOLD EUTECTIC DIE ATTACH

#### MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector - Emitter Voltage	$V_{CEO}$	80	Volts
$R_{BE} = 1K$ Ohms	$V_{CER}$	150	
Collector - Base Voltage	$V_{CBO}$	150	Volts
Emitter - Base Voltage	$V_{EBO}$	6	Volts
Collector Current	$I_C$	10	Amps
Base Current	$I_B$	2	Amps
Total Device Dissipation @ TC = 25°C	$P_D$	10	Watts
Derate above 25 °C		66.6	mW/°C
Operating and Storage Temperature	$T_j, T_{stg}$	-65 to 200	°C

#### THERMAL CHARACTERISTICS

Characteristics	Symbol	Value	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	15	°C/W

#### ELECTRICAL CHARACTERISTICS

Characteristics	Symbol	Min.	Max.	Unit
Collector - Emitter Breakdown Voltage* ( $I_C = 10mAdc$ ) ( $I_C = 20uAdc, R_{BE} = 1Kohm$ )	$BV_{CEO}$ $BV_{CER}$	80 150		Vdc
Collector - Base Breakdown Voltage ( $I_C = 20uAdc$ )	$BV_{CBO}$	150		Vdc
Emitter - Base Breakdown Voltage ( $I_E = 20uAdc$ )	$BV_{EBO}$	6		Vdc

## ELECTRICAL CHARACTERISTICS

Characteristics	Symbol	Min.	Max.	Unit
Collector Cutoff Current ( $V_{CE} = 40 \text{ Vdc}$ )	$I_{CEO}$		10	$\mu\text{A}$
Collector Cutoff Current ( $V_{CB} = 100 \text{ Vdc}$ )	$I_{CBO}$		10	$\mu\text{A}$
Emitter Cutoff Current ( $V_{EB} = 4 \text{ Vdc}$ )	$I_{EBO}$		1.0	$\mu\text{A}$
DC Current Gain* ( $I_C = 500 \text{ mA}$ , $V_{CE} = 10 \text{ Vdc}$ ) ( $I_C = 1.0 \text{ A}$ , $V_{CE} = 10 \text{ Vdc}$ ) ( $I_C = 5.0 \text{ A}$ , $V_{CE} = 5 \text{ Vdc}$ )	$h_{FE}$	50 50 50	200	
Collector - Emitter Saturation Voltage*  ( $I_C = 5.0 \text{ A}$ , $I_B = 500 \text{ mA}$ )	$V_{CE(SAT)}$		0.5	Vdc
Base - Emitter Saturation Voltage*  ( $I_C = 5.0 \text{ A}$ , $I_B = 500 \text{ mA}$ )	$V_{BE(SAT)}$		1.2	Vdc
Current - Gain - Bandwidth Product ( $I_C = 500 \text{ mA}$ , $V_{CE} = 10 \text{ Vdc}$ , $f = 1 \text{ MHz}$ )	$f_T$	100		MHz
Output Capacitance ( $V_{CB} = 10 \text{ Vdc}$ , $f = 1 \text{ MHz}$ )	$C_{ob}$		200	pf
Post Irradiation DC Current Gain* ( $I_C = 1 \text{ A}$ , $V_{CE} = 10 \text{ Vdc}$ , $1 \times 10^{14} \text{ n/cm}^2$ ) (Fast Neutrons (n) at E = 10KeV Reactor Spectrum)	$h_{FE}$	10		
On Time ( $V_{CC} = 30 \text{ Vdc}$ , $I_C = 5.0 \text{ A}$ )	$t_{on}$		200	ns
Off Time ( $I_{B1} = I_{B2} = 500 \text{ mA}$ )	$t_{off}$		800	ns

\*Pulse Test: Pulse width = 300  $\mu\text{s}$ , DutyCycle = 2%

**SSDII** SOLID STATE DEVICES, INC.